STRUCTURE OF THE MICROCARD

A02 = Special features/test specifications
A01 = Structure of microcard
B01 = 2

		1		
		SIS		
A	**XXX	XX*XX	XXXXX	XX
B	*XXXX	XXXXX	XXXXX	XXXXX XXXXX XXX
C	XXXXX	XXXXX	XXXXX	XXXXX XXXXX XXX
D	XXXXX	XXXXX	XXXXX	XXXXX XXXXX XXX
E	XXXXX	XXXXX	XXXXX	XXXXX XXXXX XX
F				
G				
H				
J				
K				
L				
M				
N				XX*

12345 67890 12345 67890 12345 678

1 2

N28 = Table of contents and publication information
1 = Tools and devices
2 = Complete instructions, divided into test steps (no references)

a. Read from left to right.

b. Title of micropicture (appears on each coordinate).

E16	Product/component/test step	
Coordinate		

c. Limits of section

==>	<==>	<==	=> <=
Beginning	Mid-section	End	One-page section

TEST SPECIFICATIONS – ELECTRICAL

Coil resistances

Holding winding	Pull-in winding
24 V : 3.18...3.35 Ω	0.52 – 0.55 Ω
12 V : 0.68...0.73 Ω	0.14 – 0.15 Ω

Solenoid switch – Test specifications

Minimum voltage for solenoid switch for tooth/tooth connection

24 V relay : ≤ 16.0 V
12 V relay : ≤ 8.0 V

Starting motor – Test specifications

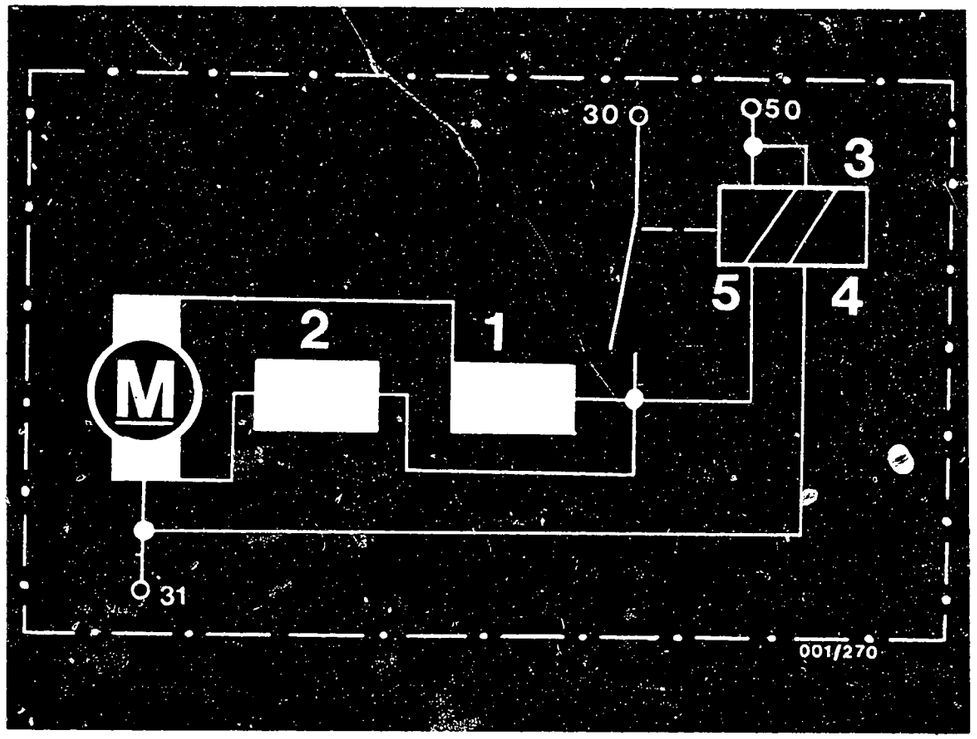
No-load values	V	A	min $^{-1}$	Torque
0 001 371 ...	24	< 150	> 7000	
0 001 370 ...	12	< 260	> 7000	
Short-circuit values				
0 001 370	4.5	< 2400		> 95 Nm
	4.0	< 2200		> 85 Nm
(with 2 batteries 12V143Ah connected in parallel)				
0 001 371 ...	10.5	< 1700		> 58 Nm
	9	< 1300		> 50 Nm
(with 2 batteries 12V143Ah connected in series)				

TEST SPECIFICATIONS – MECHANICAL

Commutator dia., new	: 45.0 mm
Commutator dia., minimum	: 42.5 mm
Brush pressure (per compression spring)	: 47 – 53 N
Carbon brush minimum length	: 17.5 mm
Longitudinal play of armature	: 0.1 – 0.3 mm
Backlash	: 0.6 – 0.9 mm

True-running error

Commutator	: 0.03 mm
Laminated core	: 0.08 mm



CIRCUIT DIAGRAM, STARTING MOTORS 0 001 370 ...; 0 001 371 .

1 = Series winding (excitation winding)
2 = Shunt winding (excitation winding)
3 = Solenoid switch
4 = Holding winding
5 = Pull-in winding

GENERAL INFORMATION

In order to guarantee perfect operation, the lubricants specified in these instructions must be used.

Professional repairs are only possible using the specified tools and measuring instruments. We therefore advise you to use only the tools listed.

Never reuse any gaskets and seal rings or the micro-encapsulated bolt at the fork lever.
The needle bushings in the drive-end-bearing housing and in the intermediate bearing must likewise be replaced.
The bolts secured with Loctite must be secured again with Loctite 5 965 930 512 before reassembly.

Slightly grease all O-rings before reassembly with special lubricating grease 5 932 240 150.

Cleaning the parts

Clean armature, winding, overrunning-clutch drive and solenoid switch only with compressed air (max. 4 bar) and a clean rag.
Do not use liquid cleaning agent.

Other parts, such as screws and armature shaft can be washed in commercially available cleaning agent of low inflammability.
Do not inhale vapors!

C A U T I O N

Parts which have been washed must be dried thoroughly since, otherwise, gases may form in the starting motor when it is later sealed - danger of explosion.

Observe local safety regulations!

NECESSARY TEST EQUIPMENT AND TOOLS

Test equipment:

Test bench for starting motor	EFAL 152 EFAL 153 EFAL 140
Test panel	KDAW 9984
Transformer panel	KDAW 9985
Interturn-short-circuit tester EFAW 90 A	0 681 103 500
Electric tester or resistance-measuring bridge	0 684 101 400 commercially available

Tools:

Press-out mandrel (for needle bushing in drive-end-bearing housing)	KDAL 5038
Push-in mandrel (for needle bushing in drive-end-bearing housing)	KDAL 5052
Push-in/out mandrel (for needle bushing in intermediate bearing)	KDAL 5040
Push-in mandrel (for seal ring in intermediate bearing)	KDAL 5053
Cap with 2 test fittings and gasket (for leakage test)	KDAL 5043
Assembly tool for brush-holder plate	KDAL 5054

NECESSARY TOOLS (continued)

Clamping pin in arbor press	KDLI 6010
Tailstock backrests for clamping the armature when turning diameter of commutator	
with Morse taper 2	KDAW 9987
with Morse taper 3	KDAW 9990
Spring scale	
Measuring range 15 ... 50 N	KDAW 9992
or	
Measuring range 0 ... 100 N	comm. avail.
Undercutting saw	KDAW 9998
Clamping support	KDAW 9999
Dial indicator	1 687 233 011
Magnetic stand	4 851 601 124
or	
Magnetic stand	comm. avail.
Torque wrench	comm. avail.
Arbor press	comm. avail.
Claw-type puller	comm. avail.

LUBRICANTS

Special lubricating grease for plain and rolling bearings, pinion, washers, shafts and radial-lip-type oil seals.

500 g can (VS 10832 Ft) 5 932 240 150

Anti-corrosion oil

1,0 l can (Ol 41 v 2) 5 701 351 610

Grease for relay armature

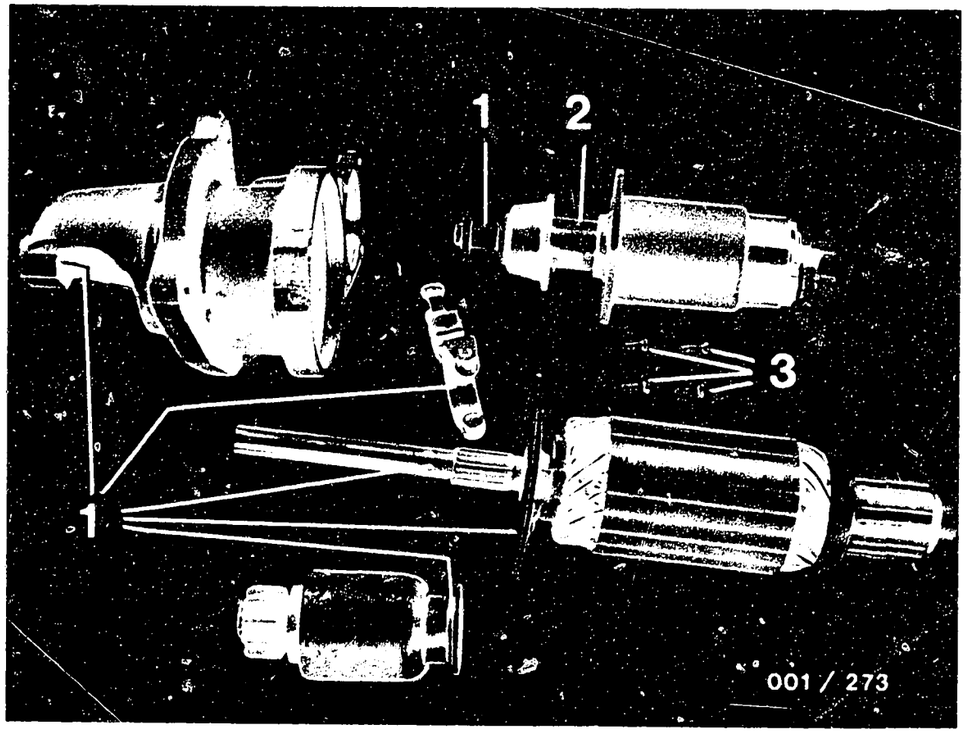
50 g tube (VS 16 634 Ft) 5 990 260 005

Loctite for securing the relay screws

50 g PVC bottle (VS 14201 Kk) 5 965 930 512

Loctite for sealing off

50 g PVC bottle (VS 14618 Kk) 5 970 100 512



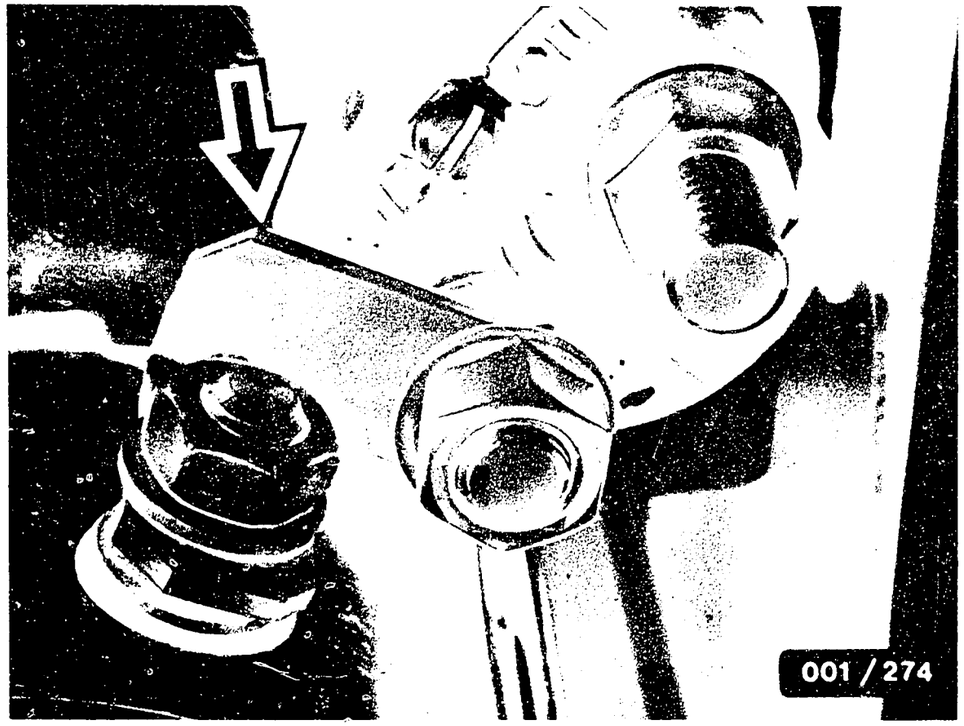
1 = 5 932 240 150
2 = 5 990 260 005
3 = 5 965 930 512

Lubrication table

Make sure that the commutator is never contaminated by grease or oil!

Grease or oil the parts stated sparingly. Too much grease causes malfunctions at low temperatures.

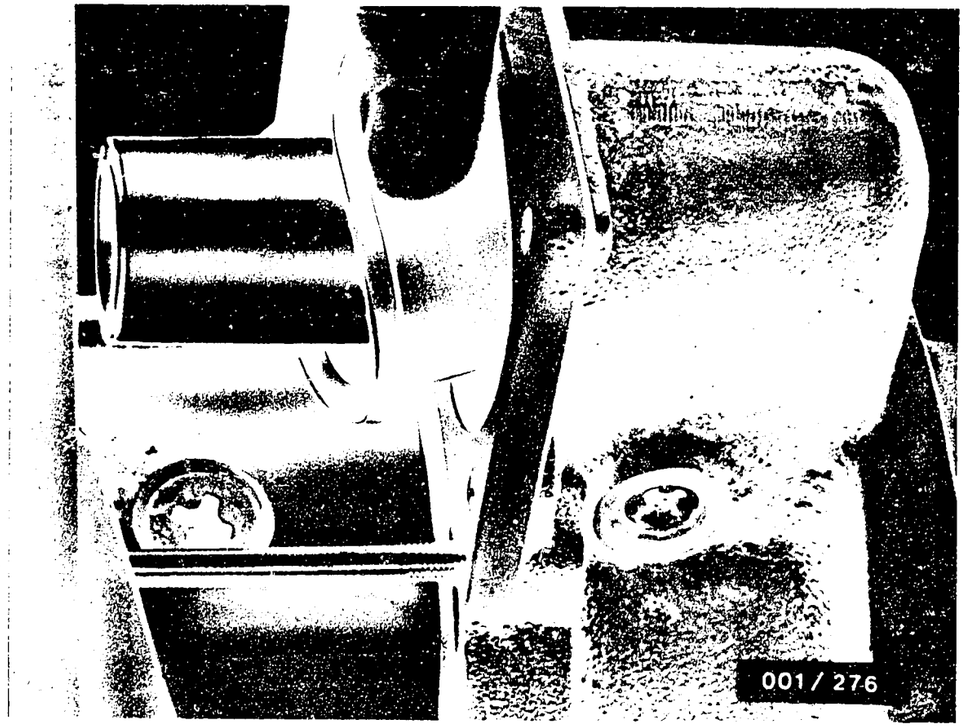
Lightly oil all bare parts with anti-corrosion oil.



DISMANTLING THE STARTING MOTOR

Mount starting motor in clamping support.

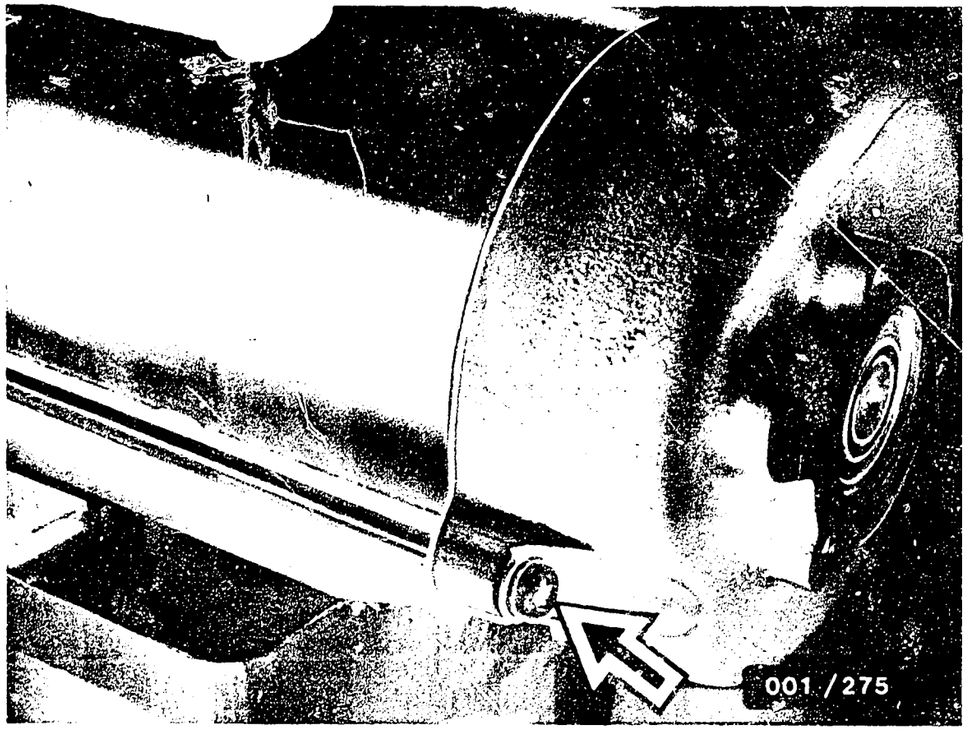
Remove bus bar (arrow).



Removing the solenoid switch

Unscrew fastening screws of solenoid switch and remove solenoid switch.

Then take hold of relay armature by rubber seal (see illustration) and unhook armature from fork lever.



Removing the commutator end shield

Remove closing cover (three fastening screws).

Remove shims for adjustment of armature longitudinal play (already removed in picture).

Remove through-bolts (illustration, arrow) and remove commutator end shield.

Note: Drive-end-bearing housing is not fixed in stator frame and must be marked before removing the through-bolts (punch mark).

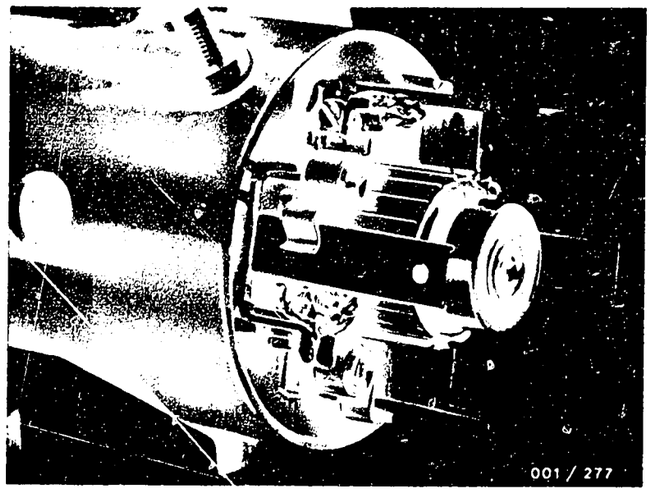
For production reasons:
continued on the following coordinate.

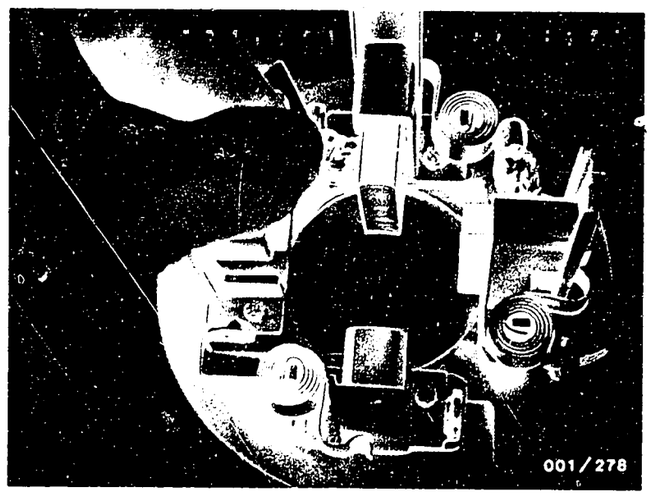
Removing the brush-holder plate and carbon brushes

Lift up brush springs using suitable wire hook and insert assembly tool KDAL 5054 (see upper illustration).

Unscrew connections of the excitation windings and carbon brushes from the brush-holder plate.
Remove brush-holder plate with carbon brushes.

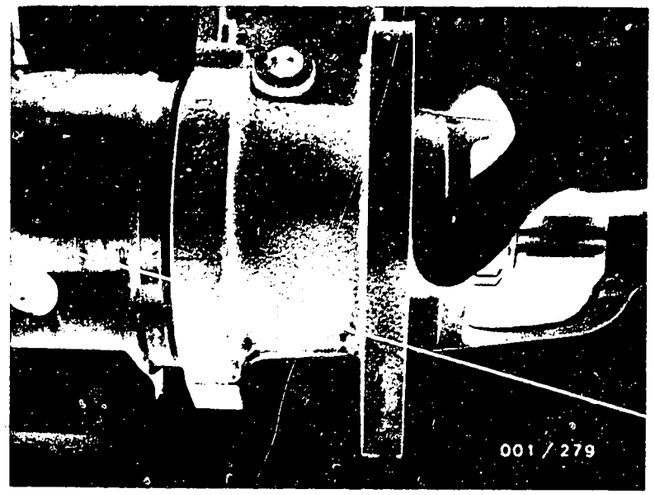
Remove carbon brushes from brush guide (see lower illustration).



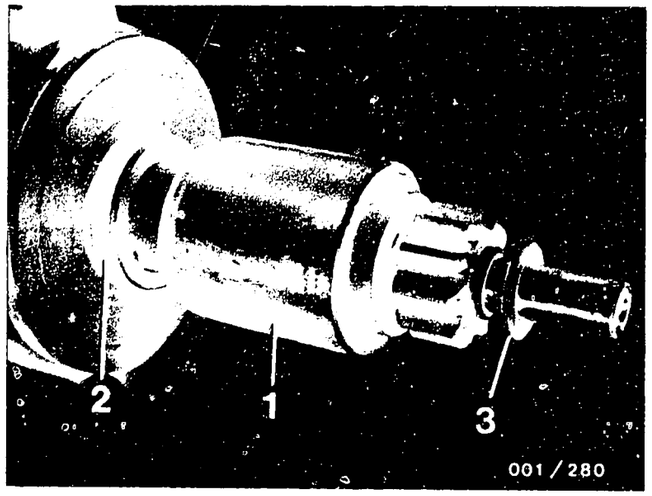


Removing the drive-end-bearing housing:

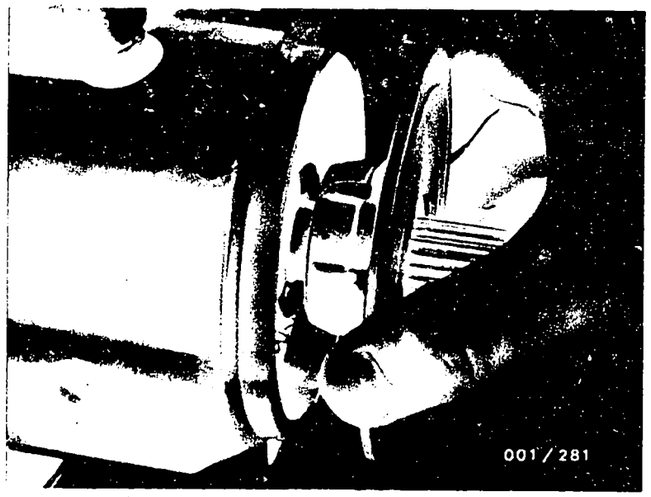
Unscrew screw of fork-lever bearing.
Remove drive-end-bearing housing from armature shaft (see upper illustration), thus unhooking fork lever from overrunning clutch.

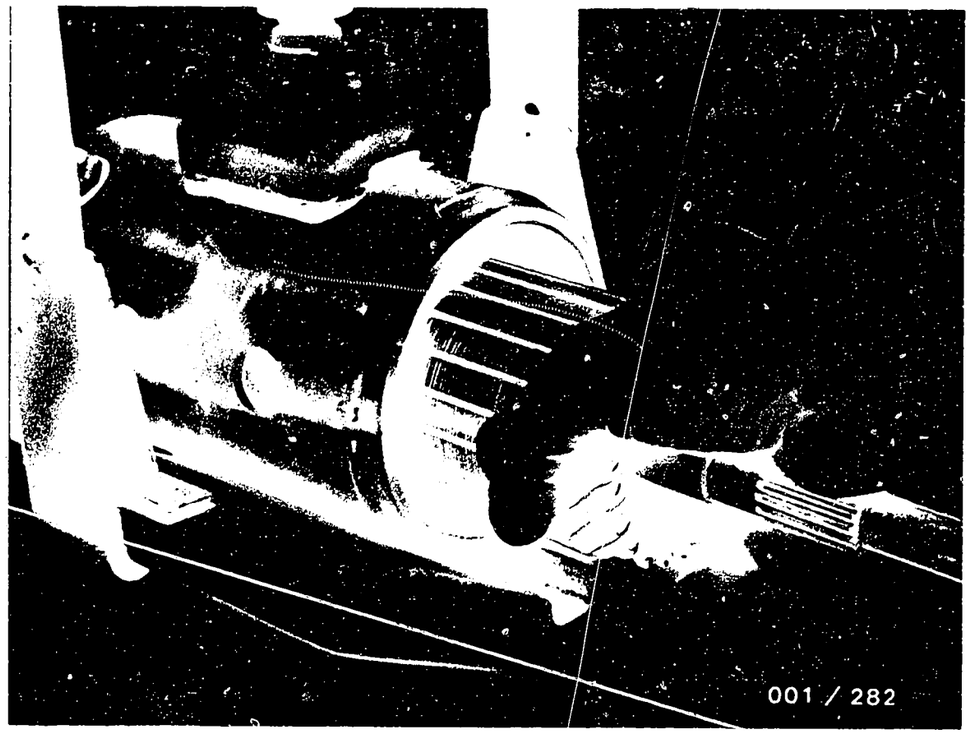


Remove pinion with overrunning-clutch drive (1), friction washer (3) and brake disk (2) from armature shaft (see center illustration)



Remove intermediate bearing with friction washer from armature shaft (see lower illustration).





Remove armature from stator frame (see illustration).
Pull off deep-groove ball bearing from anchor shaft using claw-type puller (commercially available).

Cleaning the parts

Clean armature, winding, overrunning-clutch drive and solenoid switch only with compressed air (max. 4 bar) and a clean rag.
Do not use liquid cleaning agent.

Other parts, such as screws and armature shaft can be washed in commercially available cleaning agent of low inflammability.
Do not inhale vapors!

C A U T I O N

Parts which have been washed must be dried thoroughly since, otherwise, gases may form in the starting motor when it is later sealed - danger of explosion.

Observe local safety regulations!

Working with dangerously inflammable or health-hazardous agents

Benzine, tri- or perchloroethylene are approved for the washing of motor vehicle electrical parts which are to be repaired. Both cleaning agents must be used cautiously since they are dangerous.

Benzin, acetone or ethanol are combustible liquids and can explode when mixed with air. Washing must be performed only in specially designed bowls or containers with a fused lid so that if the liquid ignites, the lid closes automatically and smothers the fire. Larger washing containers (as of 500 x 500 mm) must be provided with an extractor.

On the subject of starting motors, it has already been pointed out in earlier repair manuals that after the parts have been washed, particularly after windings have have been washed in benzine, they must be dried thoroughly. After sliding-gear starting motors have been washed, they must first of all be operated on the test bench without the closure cap in order to prevent explosions.

Tri- and perchloroethylene are liquids whose vapors have an anesthetic effect and are hazardous to health if inhaled over long periods of time. Trichloroethylene vapors are heavier than air and, therefore, the risk is greater near ground level.
Protective goggles and gloves must be worn when washing.

Regular or continuous cleaning with trichloroethylene must take place only in specially designed containers with the extractor switched on. When washing, avoid leaning over the trichloroethylene container.

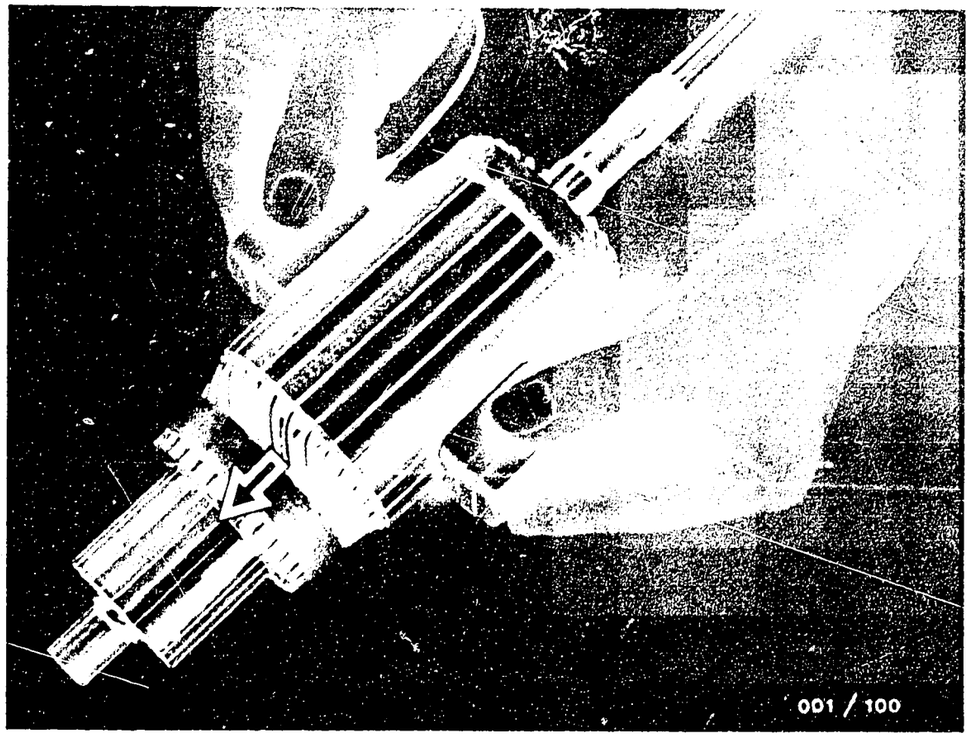
General

Examine all parts for wear and damage. Replace worn or damaged parts.

Used micro-encapsulated screws or seals must not be re-used.

Lubricate the starting motor before and during assembly in accordance with the lubrication table. Where necessary, lubrication points and lubricants are given in the text.

In addition, there is a complete lubrication table on coordinates A9 – A10 of this manual.



Testing the armature

Test armature for interturn short circuit using tester 0 681 103 500 or ... 020 (see illustration).

Test for short circuit to ground using tester KDAW 9984 and 9985.

Test voltage: 80 V for 24 V starting motors
40 V for 12 V starting motors.

Check for any open circuits (single laminations are black – arrow).

Skimming and undercutting the commutator

If the armature has to be removed, skim the commutator if necessary (if score marks are visible).

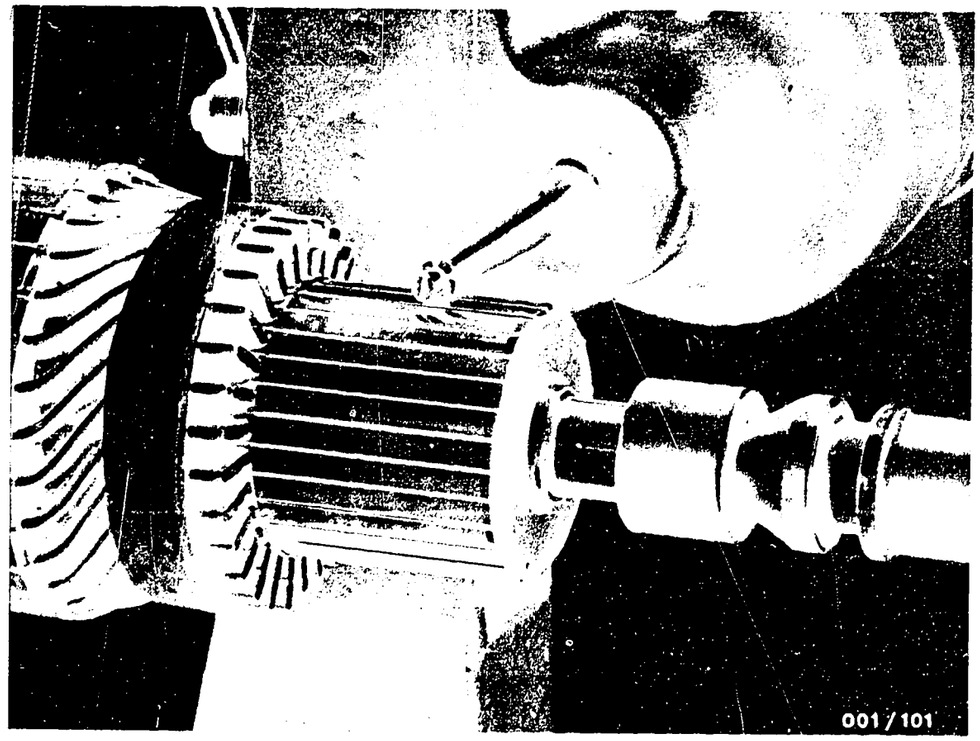
Burnt points indicate short circuit of the armature windings – armature must be replaced.

Clamp armature on the commutator end and drive-end-bearing-housing end. Do not damage the armature shaft when doing this.

Rough-turning:

We recommend the use of a carbide cutting tool.
Skim the commutator until score marks are no longer visible.

Minimum commutator diameter: 42.5 mm.



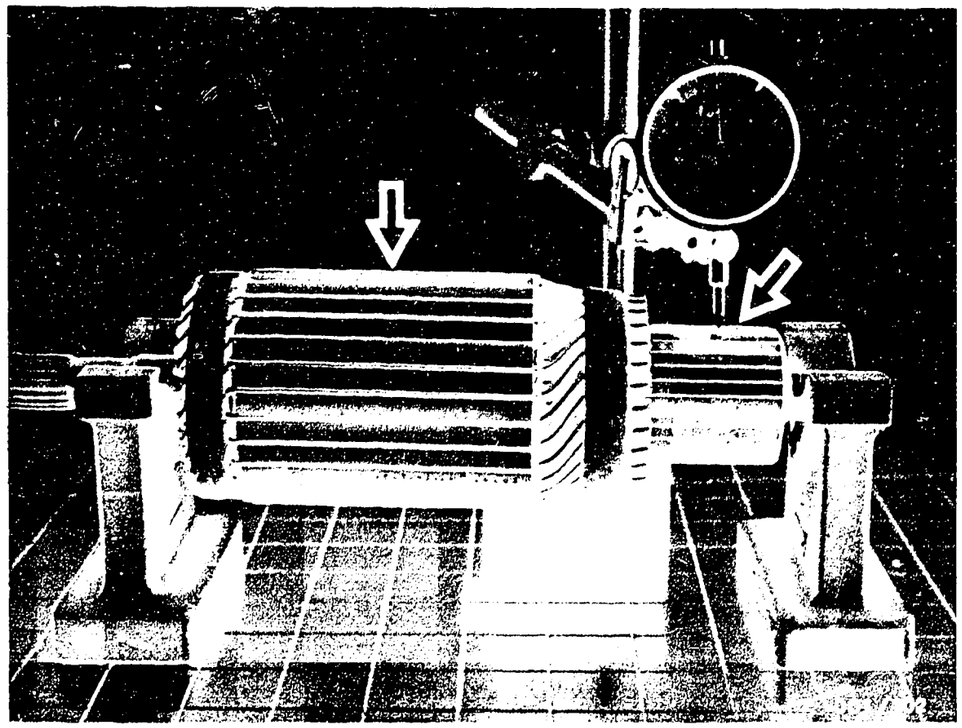
Undercutting and finish-turning the commutator

Clamp commutator in the clamp of the undercutting saw KDAW 9998. Undercut insulation between the laminations to a depth of 0.8 mm.

Note:
The insulation between the commutator laminations contains asbestos; the dust given off must under all circumstances be extracted.

HEALTH HAZARD!

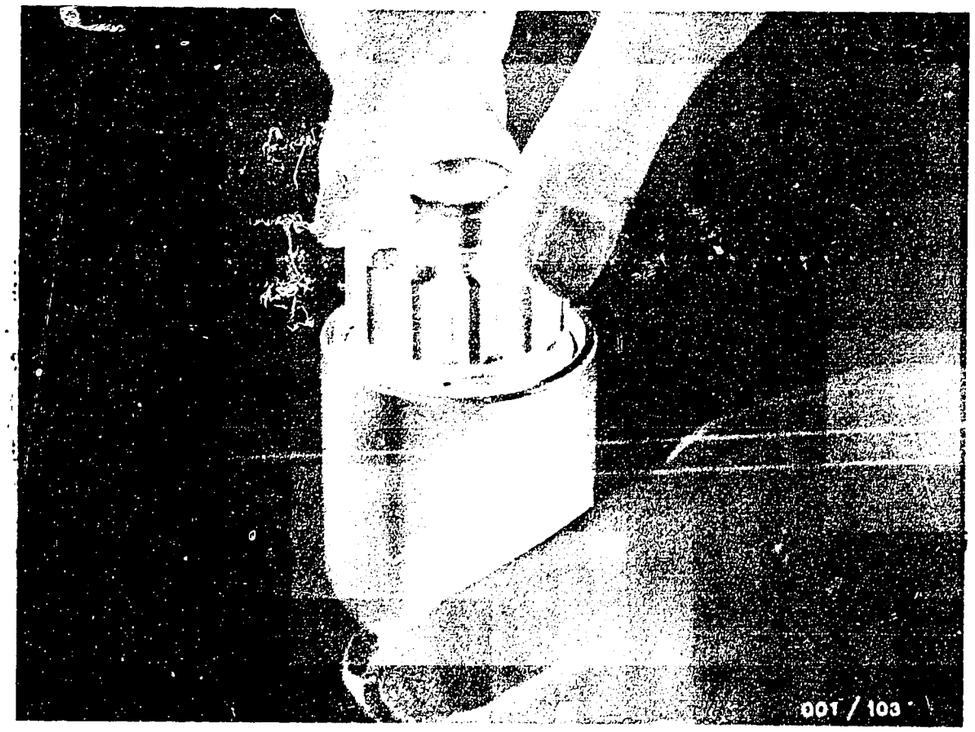
Finish-turning:
Clamp commutator in lathe again and skim with fine turning tool.
Turning chips may be max. 0.03 mm thick.
After finish-turning, brush out the commutator using a clean thread-cleaning brush free from oil and grease.



Testing true running of the armature:

Commutator ≤ 0.03 mm
Laminated core ≤ 0.08 mm

Check the winding bindings for damage.



Testing the overrunning-clutch drive

Visual examination:

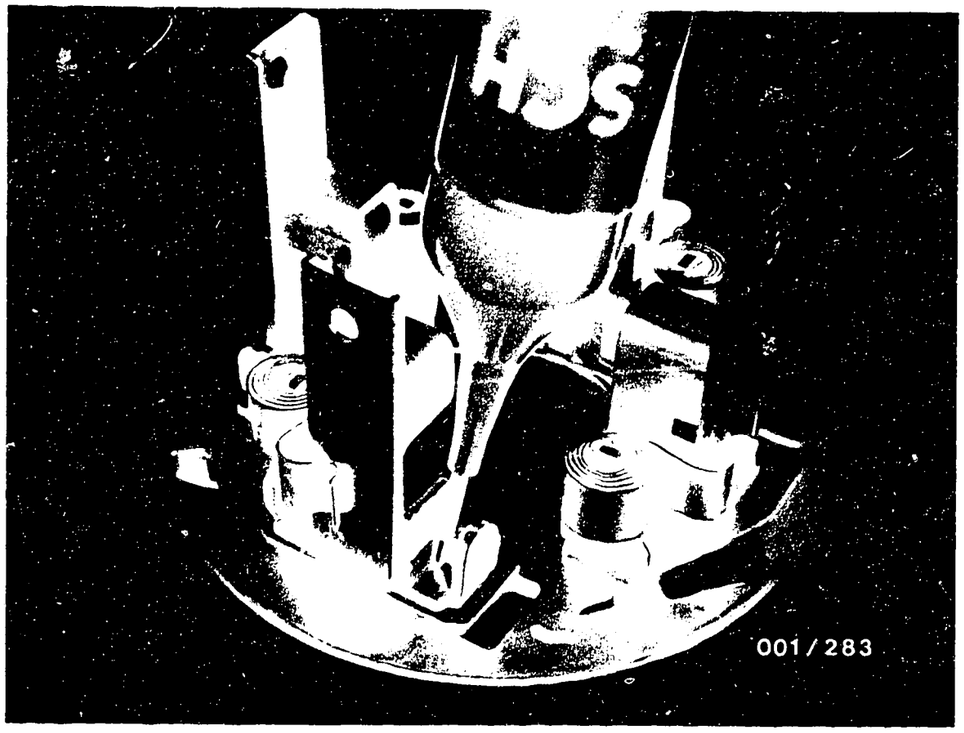
Surfaces must be free of damage - pay particular attention to the pinion and driver!

Functional test:

- Hold the housing rigid and turn the pinion in the direction of drive. The clutch toothing must indicate operation of the overrunning clutch by making an audible rattle noise.

- Hold the housing rigid and turn the pinion in the opposite direction - frictional connection.

- Hold the housing rigid and press the pinion into the housing as far as it will go. The pinion must be able to be pushed in by at least 10 mm (see illustration).
  On being released, the pinion must spin back again to its initial position (see illustration).

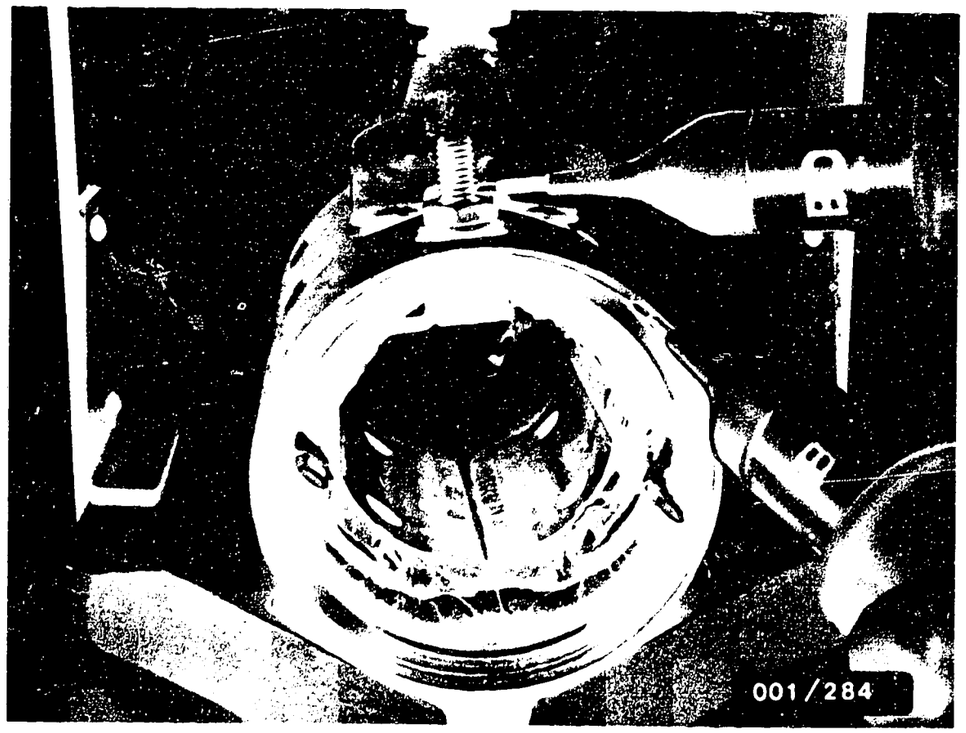


Testing the brush holders

Test the isolated brush holders for short circuit to ground.

Tester KDAW 9984 and KDAW 9985
Test voltage 80 V.

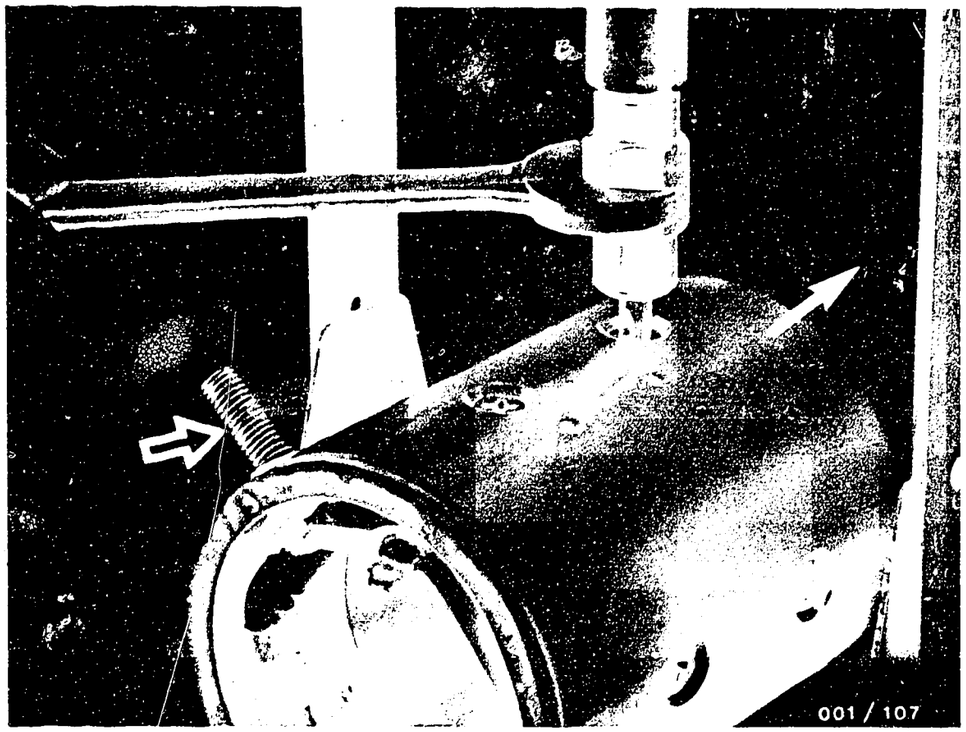
Check the spiral springs of the carbon brushes. Replace damaged or burned-out spiral springs.



Testing the stator frame with the excitation winding, main and shunt windings

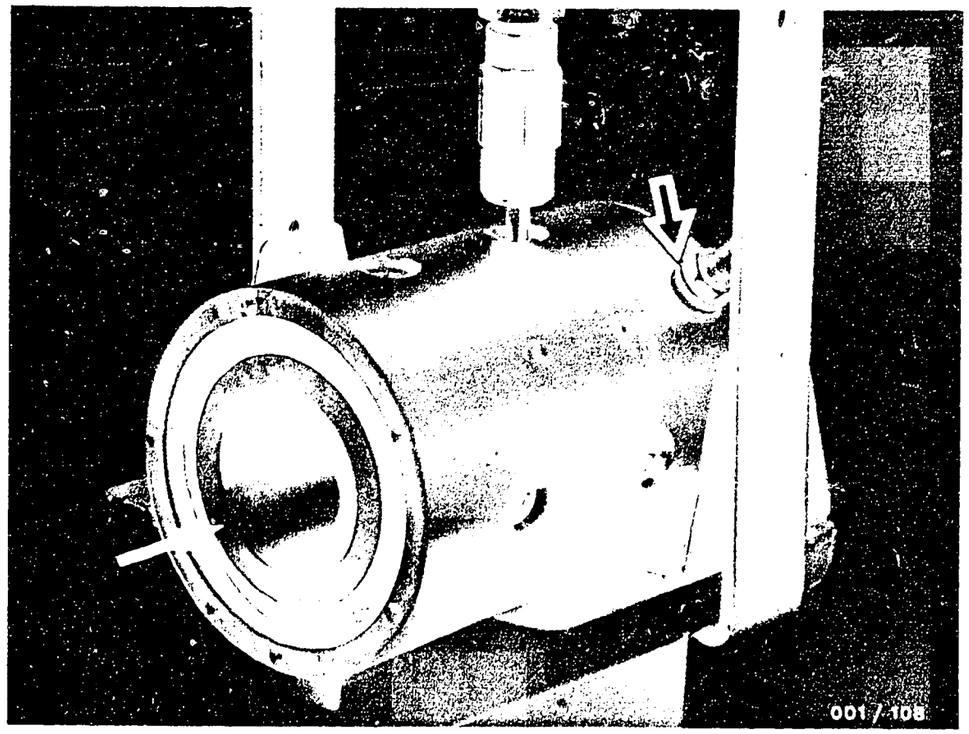
Test excitation winding for short circuit using tester KDAW 9984 and KDAW 9985.
Test voltage: 6 V DC.

Perform ground-short-circuit test (see illustration).
Test voltage: 80 V for 24 V starting motors
40 V for 12 V starting motors.



Removing the excitation winding

Mark the position of the pole shoe. Clamp the stator frame in the clamping support. Disassemble the nut and bolt of the excitation winding (arrow) and pole screws. Remove the windings together with the pole shoes from the stator frame in the direction of the arrow.



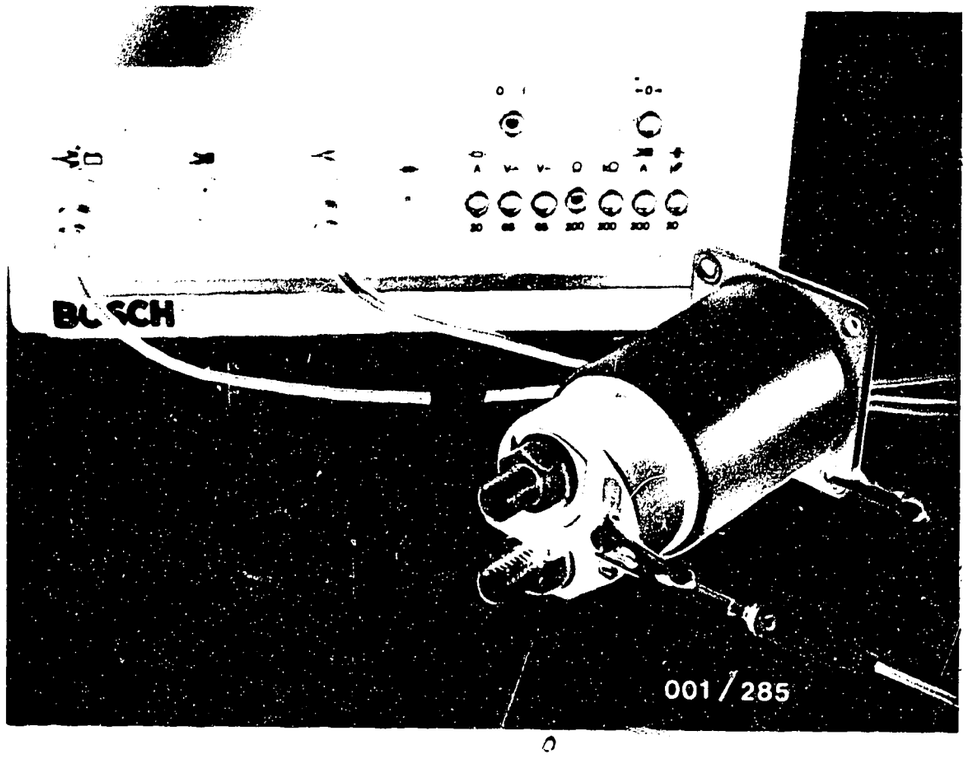
Installing the excitation winding

Slightly warm up excitation winding and insert into stator frame with pole shoes in direction of arrow (pay attention to marking).
Screw in excitation winding slightly and press in drive-in mandrel with arbor press.

Drive-in mandrel for user-fabrication:

d = 75.95 (- 0.11...-0.16) mm
L = 135 mm

Clamp stator frame in clamping support and tighten pole screws.
Tightening torque 48...64 Nm.
Assemble insulating washers, bolt and nut of the excitation winding (arrow).
Tightening torque 17...19 Nm.
Push out drive-in mandrel with arbor press.
Test installed winding once again for short circuit to ground and open circuit.

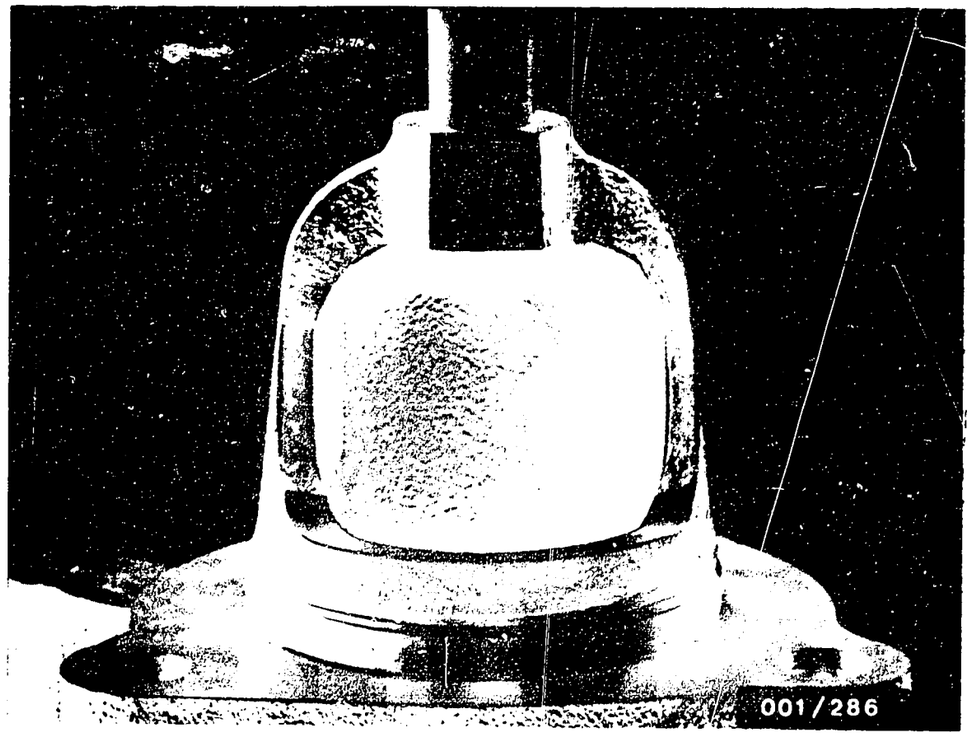


Testing the solenoid switch

Check for damage.
Test resistance of holding and pull-in windings (using electric tester ETE 014.00).

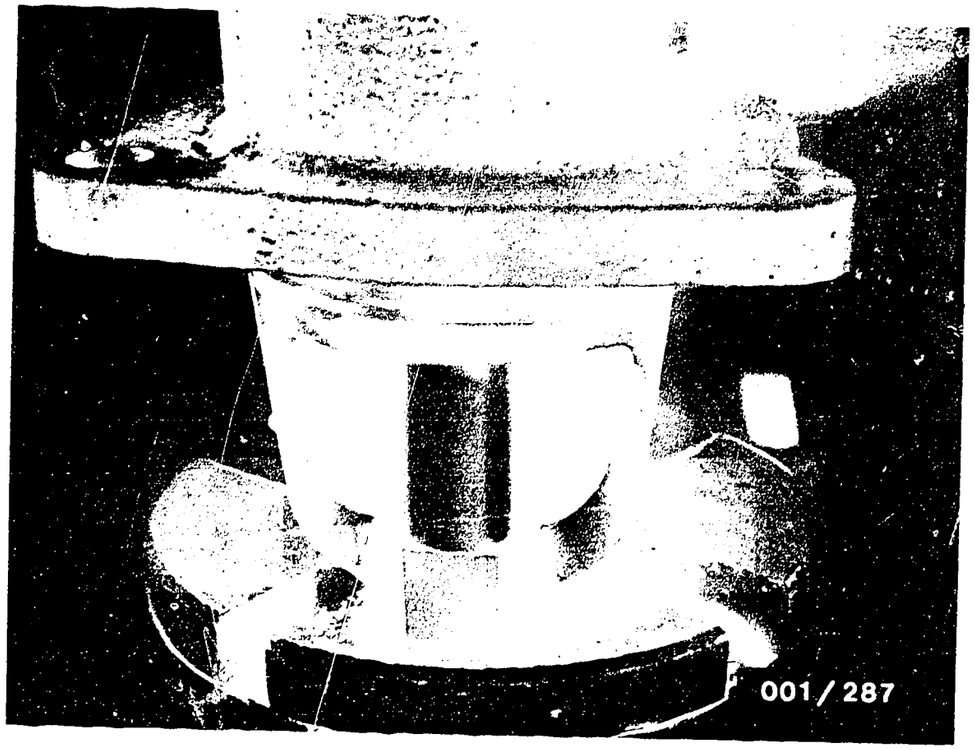
Holding winding	Pull-in winding
24 V: 3.18 – 3.35 Ω	0.52 – 0.55 Ω
12 V: 0.68 – 0.73 Ω	0.14 – 0.15 Ω

Whenever testing their operation, apply the pull-in winding to voltage for a max. of 4 sec. and the holding winding for a maximum of 90 sec.



Removing the needle bushing in the drive-end-bearing housing

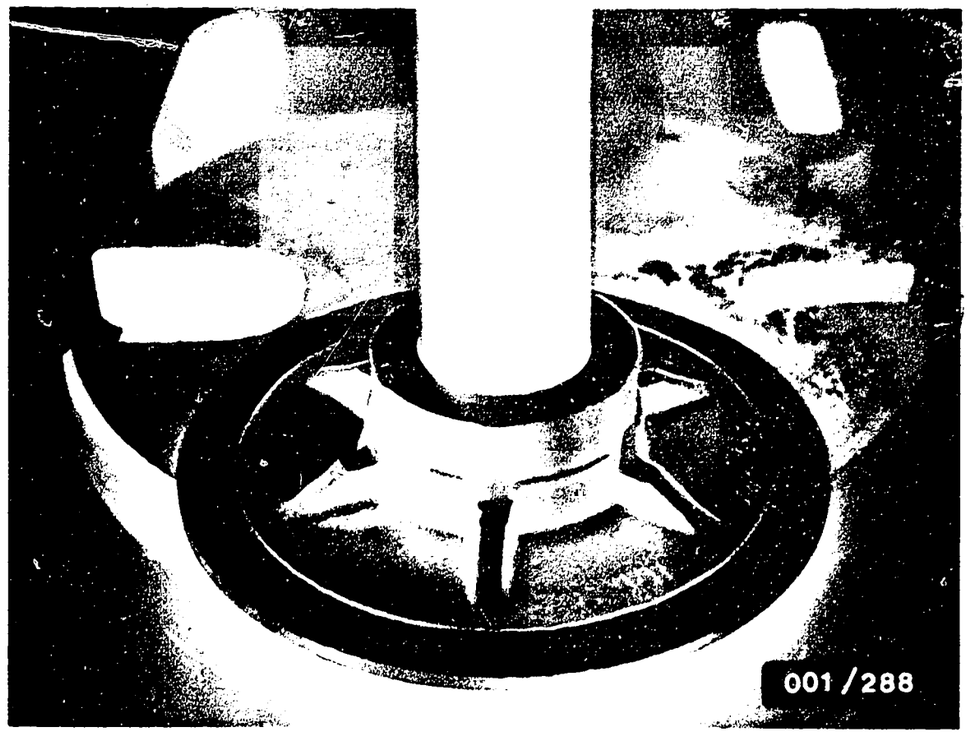
Press the needle bushing out of the drive-end-bearing housing using push-out mandrel (KDAL 5038) (see illustr.).



Installing the needle bearing in the drive-end-bearing housing

Position the needle bearing onto the push-in mandrel (KDAL 5052) (marking on the needle bearing must point upwards towards the pressing-in tool).

Press the needle bearing into the drive-end-bearing housing by as far as the tool will go.



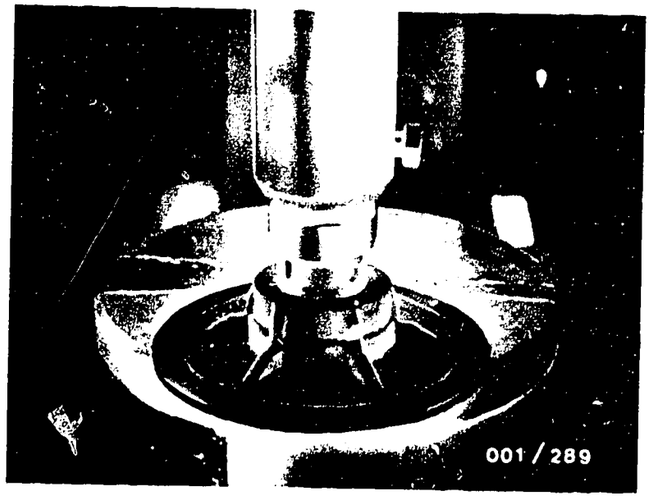
Removing the needle bearing in the intermediate bearing

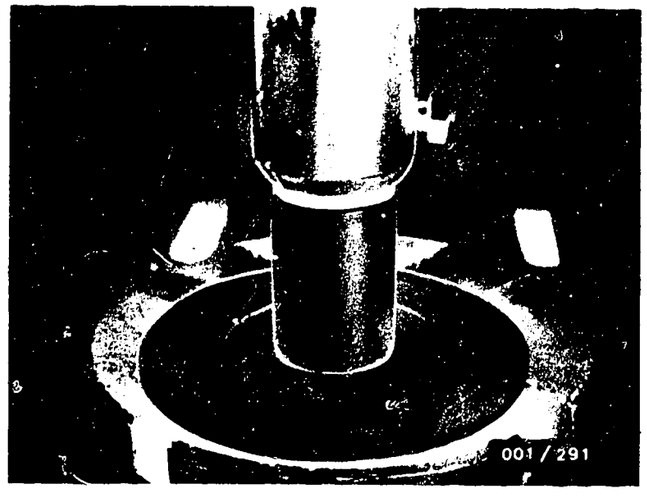
Push the needle bearing and seal ring out of the intermediate-bearing end shield using push-out mandrel (KDAL 5039) (see illustration).

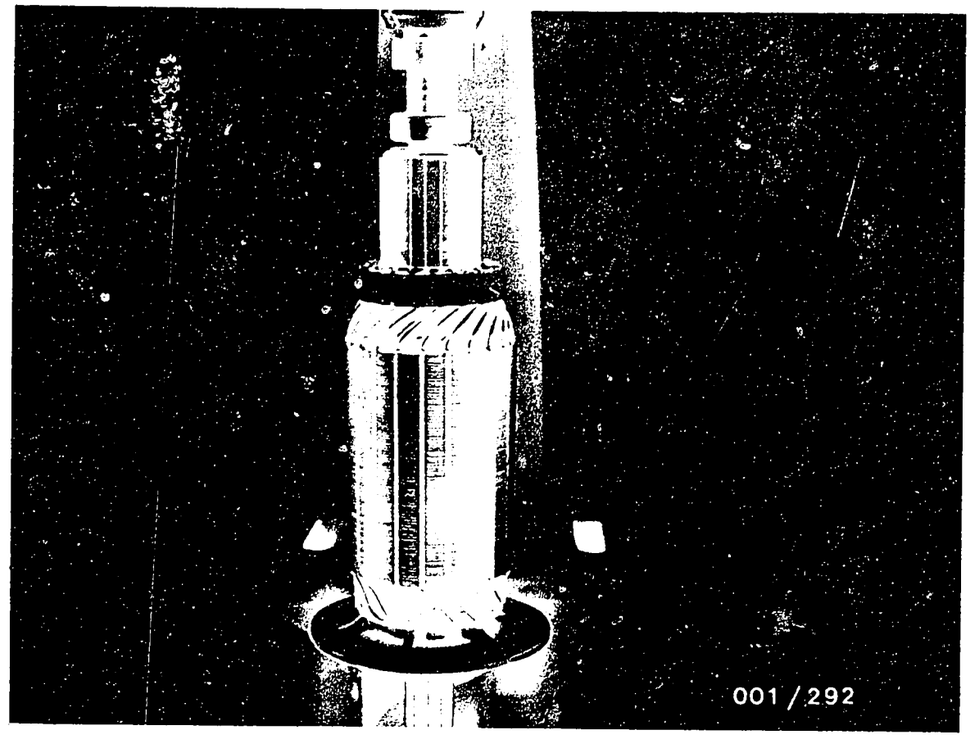
Installing the needle bearing of the intermediate bearing

Position the needle bearing of the intermediate bearing on the press-in mandrel (KDAL 5040) and push the needle bearing into the intermediate-bearing end shield as far as it will go (see upper illustration).

Press the seal ring in the intermediate bearing into the intermediate-bearing end shield as far as it will go using the push-in mandrel (KDAL 5053) (see center and lower illustrations).







For production reasons:
continued on the following
coordinate.

ASSEMBLING THE STARTING MOTOR

Assembling the armature

Press the deep-groove ball bearing onto the armature shaft using the press-on mandrel (KDAL 5040) (see illustration).

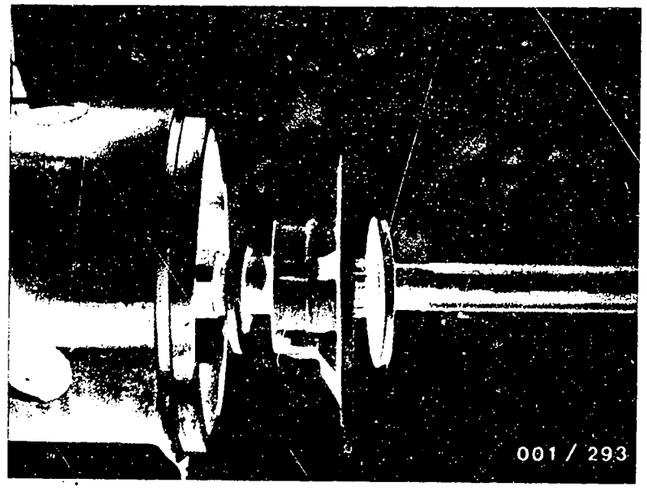
Lightly grease the spline profile and gear track along its full length with lubricating grease 5 932 240 150 (approx. 3 g).
Lightly oil all other bare parts with anti-corrosion oil 5 701 351 610.

Keep the commutator free from oil and grease!

Clamp the stator frame in the clamping support KDAL 9999.
Push armature into stator frame from the drive-end-bearing housing end.

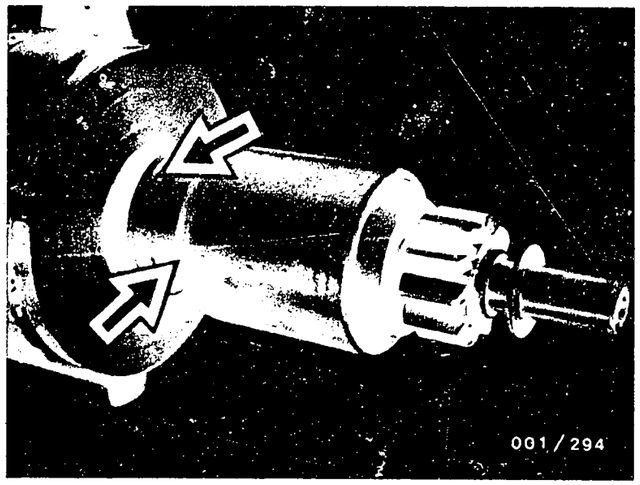
Installing the intermediate bearing

Check the thrust ring and brake disc for damage and if necessary replace.
Position the thrust ring, intermediate bearing and brake disc onto the armature shaft (see upper illustration).



Installing the overrunning-clutch drive

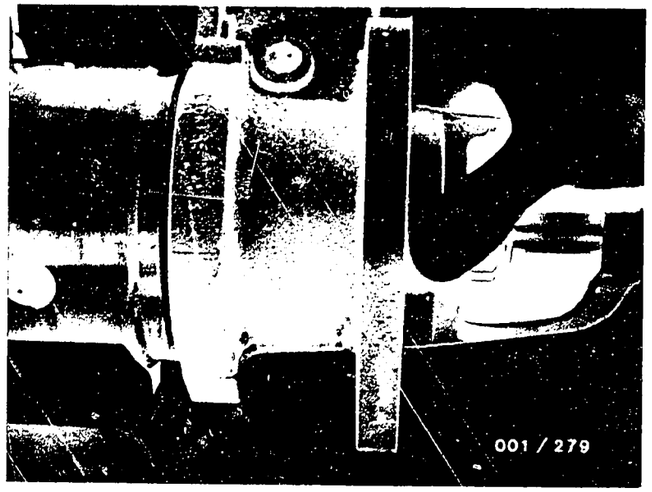
Grease both sides of the groove for the fork-lever bolt on the overrunning-clutch drive (see lower illustration, arrows) with special lubricating grease 5 932 240 150 (0.75 g per side).
Push overrunning-clutch drive with pinion and thrust ring onto armature shaft (see lower illustration).



Installing the drive-end-bearing housing

Position the drive-end-bearing housing with the fork lever (see upper illustration). To do this, lift the fork lever slightly and hook it into the overrunning-clutch drive.
Afterwards, insert the bearing screw for the fork lever and tighten (use new micro-encapsulated screw).

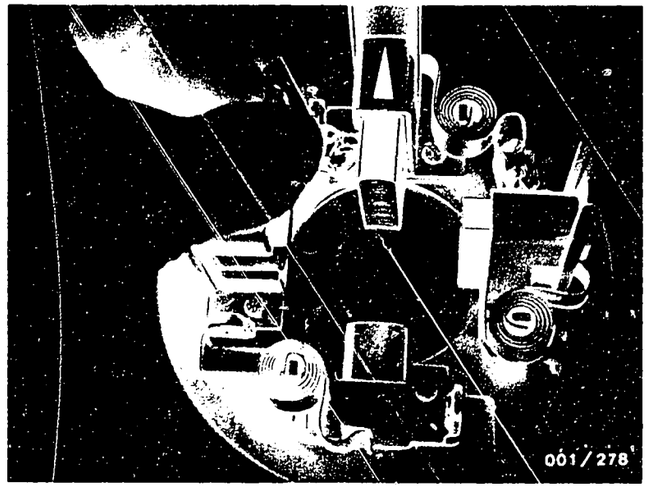
Note: Drive-end-bearing housing is not fixed in the stator frame.



Installing the brush-holder plate

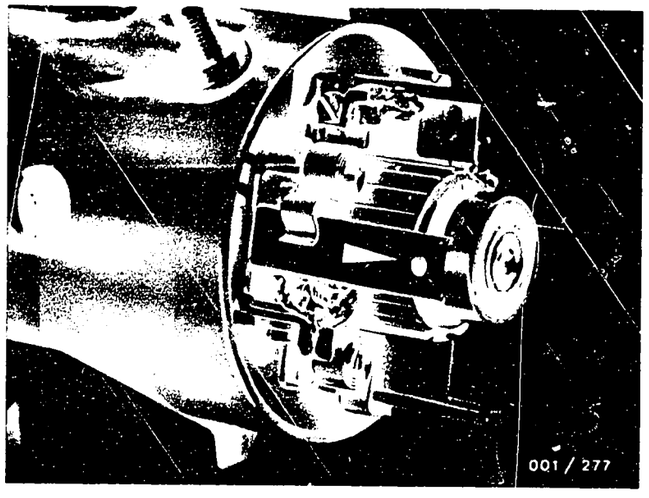
Insert new carbon brushes into the brush guide (see center illustration).

Minimum carbon-brush length:	17.5 mm
Brush pressure with new carbon brushes:	47...53 N

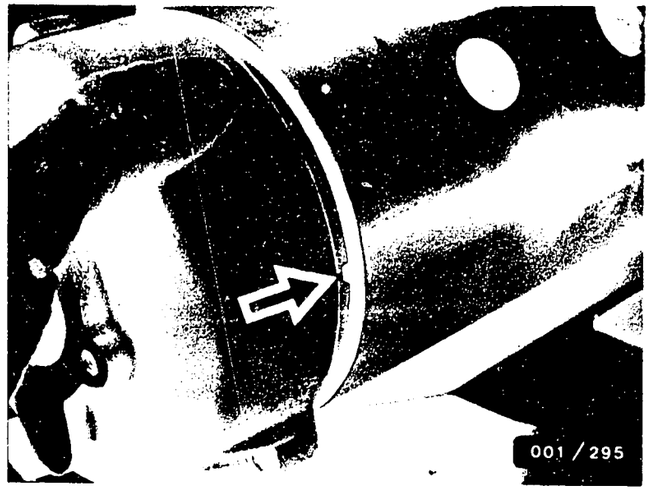


Insert the brush-holder plate with the carbon brushes over the commutator into the stator-frame pilot. Note the lock (lower illustration, arrow).
Screw the brush shunts of the carbon brushes and the connections of the excitation windings on tight. Tightening torque: 3...4 Nm.
Lift up the spiral spring using a suitable wire hook and pull out assembly tool (KDAL 5054) (see lower illustration).

Note: Push the brush shunts of the carbon brushes outwards using a suitable tool.

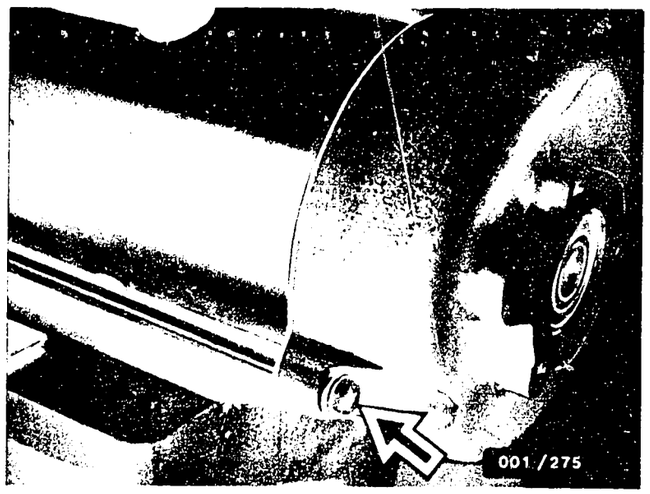


Position the commutator end shield.
Note the lock (upper illustration, arrow).



Align the drive-end-bearing housing with the marks made when disassembling.
Insert the through-bolts (lower illustration, arrows) and tighten.
Tightening torque: 9.8...12.2 Nm.

Note: The drive-end-bearing housing is not fixed to the stator frame. The purpose of the markings made when disassembling is to ensure that the through-bolts are screwed in parallel to the armature.



Adjusting the armature longitudinal play

Press the armature with the deep-groove ball bearing against the drive-end-bearing housing by hand. Using a caliper gauge or depth gauge, measure the penetration dimension between the deep-groove-ball-bearing outer ring and the end face of the commutator end shield = dimension x (see upper illustration).
Do not measure to the center of the armature shaft!

Determine the difference in length (x - armature longitudinal play).
Example: Penetration dimension (x) = 2.7 mm
Armature longitudinal play = 0.2 mm

Difference in length = 2.5 mm

Desired armature longitudinal play = 0.1...0.3 mm

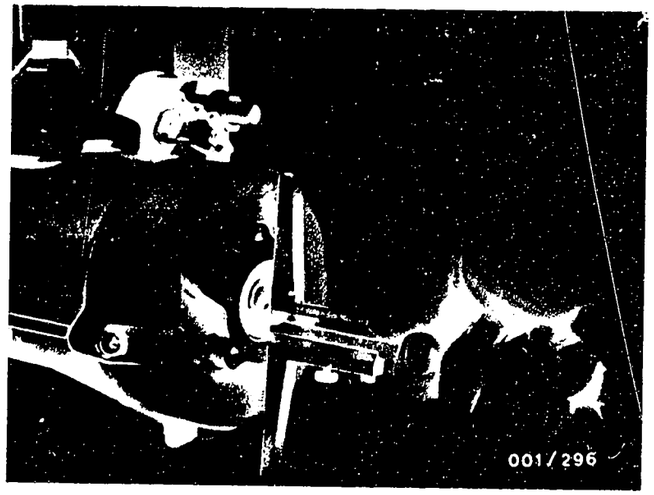
The armature longitudinal play may be adjusted using 3 different thicknesses of shim:

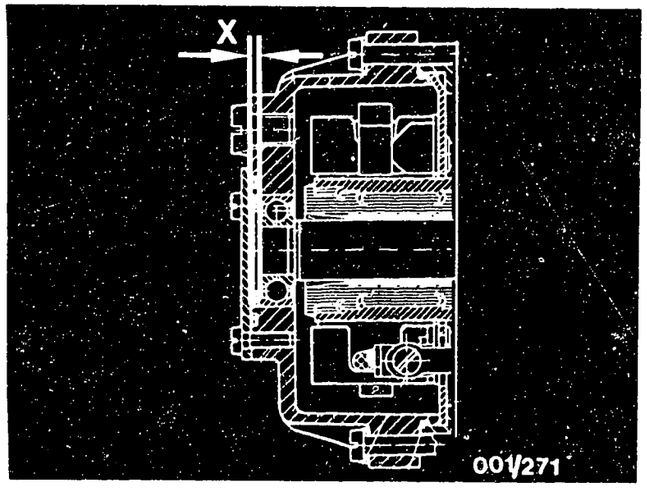
1.0 mm
1.2 mm
1.5 mm

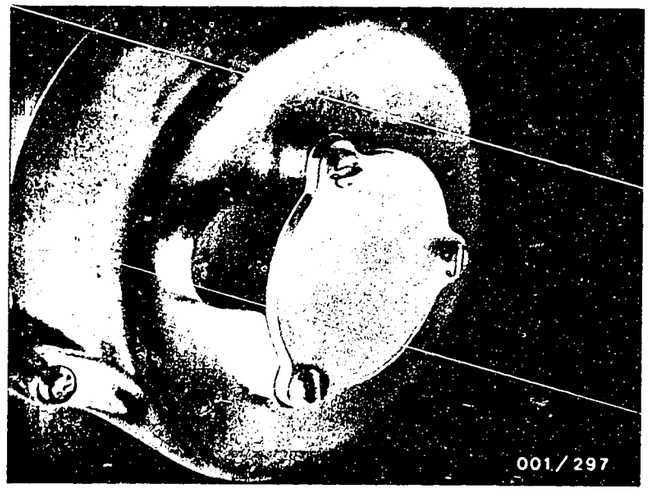
Example: Difference in length = 2.7 mm
Shim 1 = 1.5 mm
Shim 2 = 1.0 mm

Armature longitudinal play = 0.2 mm (desired=0.1..0.3 mm)

Insert the appropriate shims into the opening at the commutator end shield. Position the closure plate (use a new O-ring for the water-tight version) and screw in the three fastening screws.
Tightening torque: 4...5 Nm.







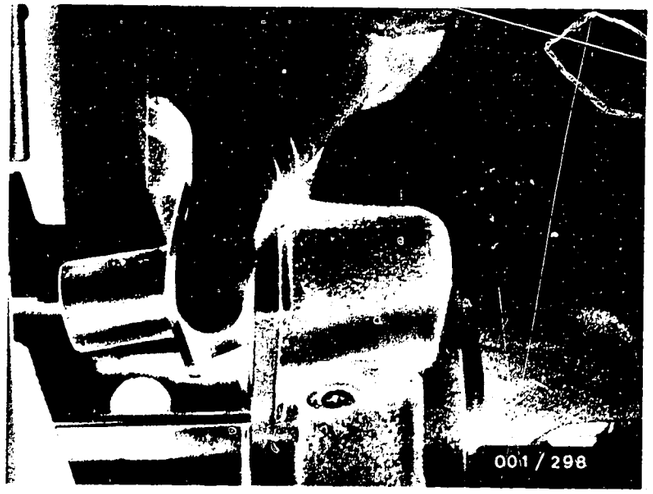
Assembling the solenoid switch

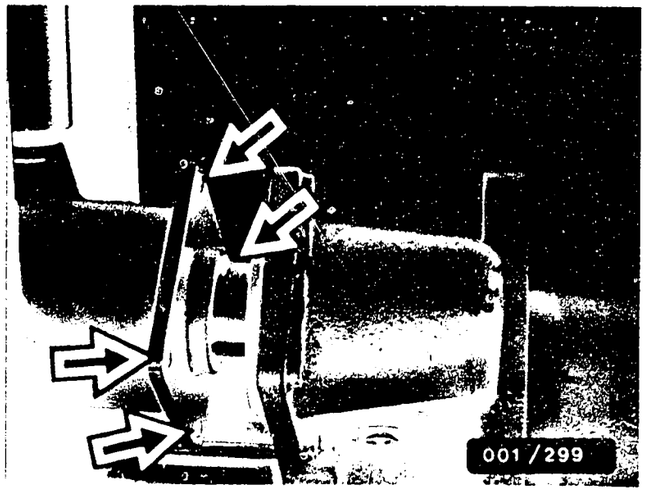
Lightly grease the relay armature with grease 5 990 260 005 (approx. 0.15 g).

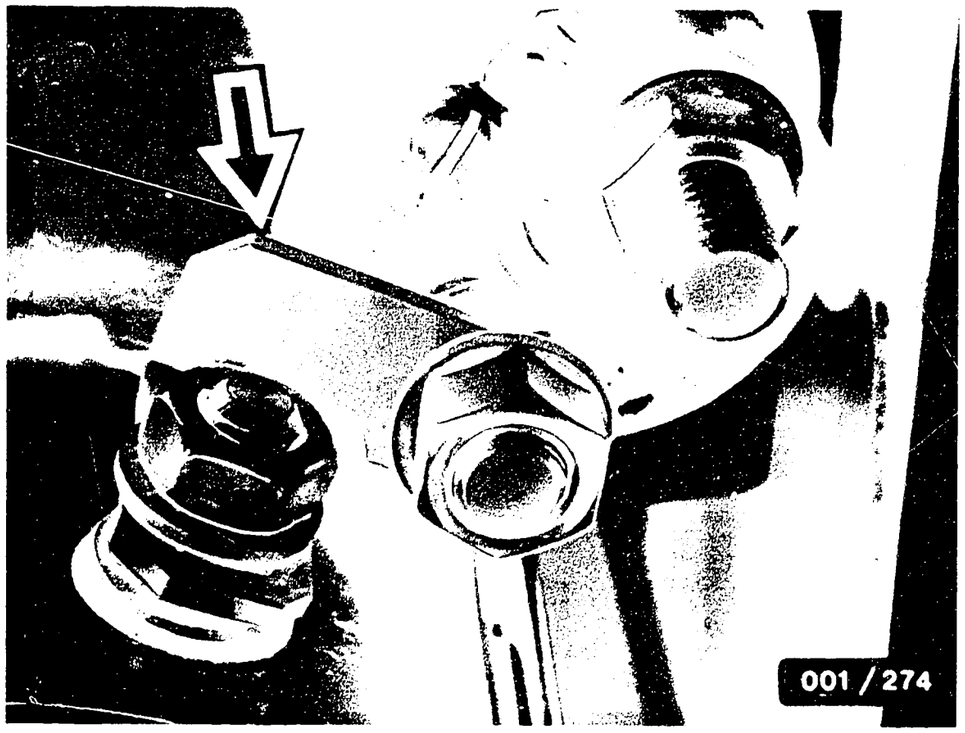
Take hold of the armature by the rubber seal and insert the roll of thread into the fork lever from above (see upper illustration).

Push on the relay and screw in the fastening screws (lower illustration, arrow) (secure fastening screws with Loctite 5 965 930 512).

Tightening torque: 7.6...8.4 Nm



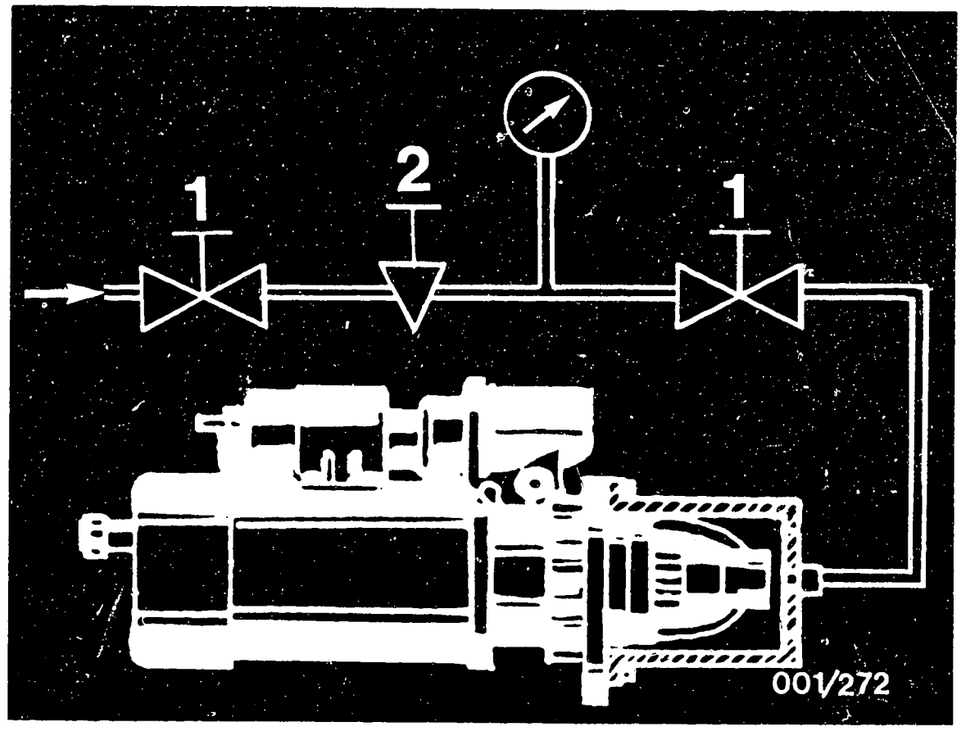




Assembling the bus bar (see illustration, arrow).

Note: Firstly position both fastening nuts by hand.

Tighten the screws of the bus bar.
Tightening torque: 16...20 Nm.

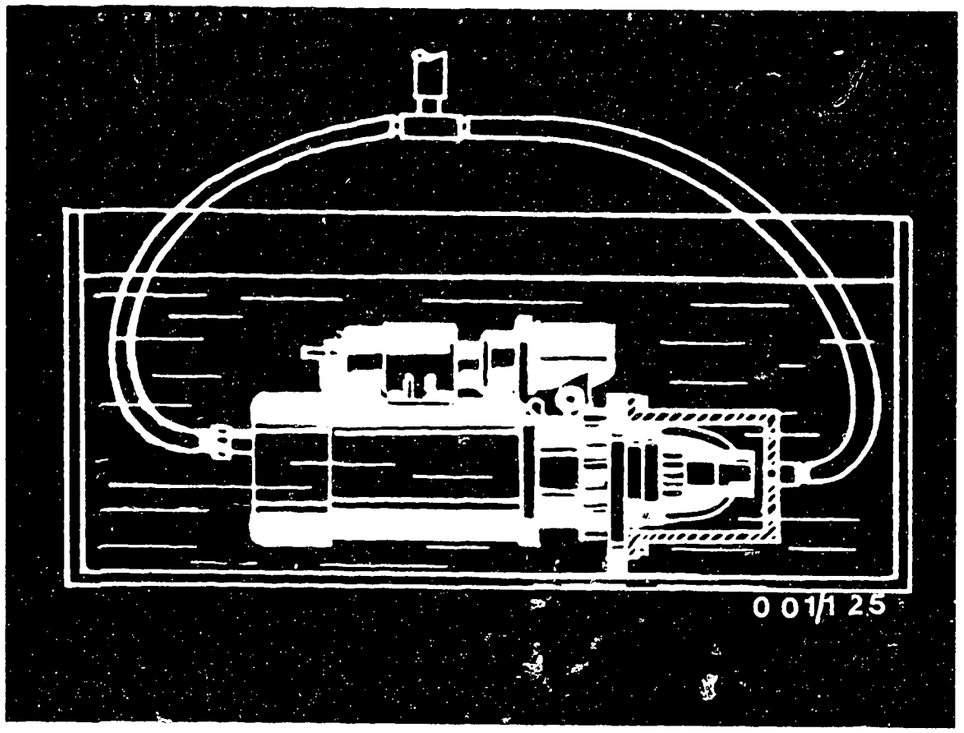


1 = Shutoff valve
2 = Pressure reducer

SPLASH OIL TEST

Seal the starter at the drive-end-bearing-housing end with cap (KDAL 5043).
Connect the compressed-air line.
Set a test pressure of 0.2 bar.
Must be 100% leakproof.
Unscrew the plug at the commutator end shield.
Set a test pressure of 0.5 bar and close the shutoff valve.
Test the pressure drop:
Permissible pressure drop = 0.05 bar
for splash-oil-protected starting motors in 5 s,
for pressure-oil-protected starting motors in 10 s.
After the test, reseal the plug at the commutator end shield (use Loctite).

Tightening torque: 16...20 Nm.



Leakage test (water-protected version)

Unscrew the plug at the commutator end shield.
Screw the test fitting (KDAL 5043/2) with flat seal ring and compressed-air lead into the commutator end shield.
Seal the starting motor at the drive-end-bearing housing end with a cap (KDAL 5043).
Join the compressed-air lines to a "T-piece" and connect.

Test pressure: 0.1 bar
Test duration: 60 s.

The starting motor must be completely under water (see illustration).
There must be no air bubbles.
After testing, reseal the plug at the commutator end shield (use Loctite).

Tightening torque: 16...20 Nm.

TESTING ON THE TEST BENCH

General

The following test benches may be used:

EFAL 140 in connection with a clamping flange for 12 V and 24 V starting motors.

EFAL 152 Not suitable for the short-circuit test on 12 V starting motors (power consumption max. 2500 A).

EFAL 153 For short-circuit testing of 12 V starting motors, the current-measurement range must be switched off (no button for current measurement must be pressed on the test bench). Test only the voltage and torque.

Clamp the starting motor properly in position on the test bench.
Connect the positive and negative cables of the test bench to the starting motor. Properly tighten the electrical connections (connecting pins).

The electrical test specifications depend on the condition of the battery (capacity and state of charge) and the duration of the test (heating up of the starting motor, discharging of the battery).
The test specifications apply only to the test bench and cannot be used for starting motors installed on the engine/in the vehicle. A small starting motor is more heavily loaded by the battery installed in the test bench, whereas, with the largest types of starting motor, the capacity of the test bench battery is not sufficient to obtain the maximum power. The longer leads which are inevitable in the test bench also influence the power of the starting motor. Therefore, the duration of the test should be as short as possible and the batteries should be properly charged, at least three quarters charged.
In the case of defective starting motors, the measured values differ considerably from the stated test specifications. In this case, disassemble the starting motor once again and repeat the tests on the individual parts.

Minimum pull-in voltage for solenoid switch (installed on starting motor)

In the case of the specified voltage values, the bearing sleeve of the overrunning-clutch drive must be pushed at least 10 mm forwards (towards the drive-end-bearing housing).

Minimum voltage with tooth/tooth connection:

24 V solenoid switch: ≥ 16 V
12 V solenoid switch: ≥ 8 V

No-load and short-circuit tests

The test specifications are with reference to 2 x 12 V 143 Ah batteries, 3/4 charged in series connection for 24 V starting motors or in parallel connection for 12 V starting motors.

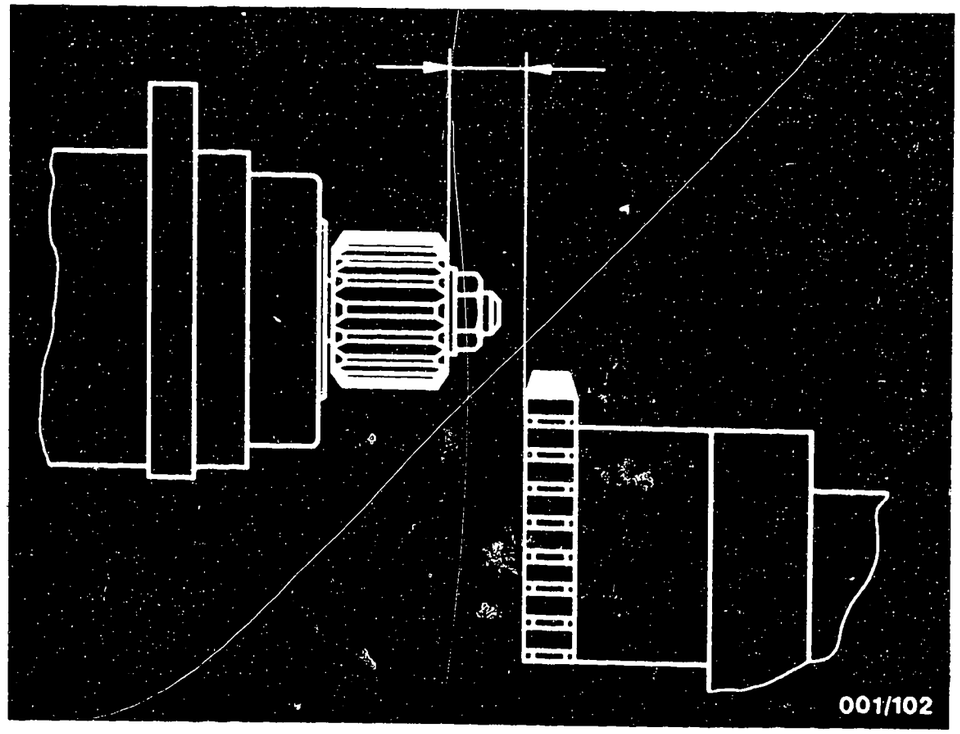
No-load test	V	< A	> min $^{-1}$
0 001 370 ...	12	260	7000
0 001 371 ...	24	150	7000

Short-circuit test

For the short-circuit test, the ring gear or gear segment of the test bench and of the starting-motor pinion must have the same module (toothing). Otherwise, replace the ring gear of the test bench or adjust another gear segment (see specifications of vehicle electrics for the module and number of teeth of the starting-motor pinion).

Backlash

The backlash is the distance (play) between the tooth flanks of the meshed pinion and those of the ring gear/gear segment.
To make the measurement, mesh in the pinion electrically (energize only term.50), and test the backlash using a feeler gauge (not possible if starting motor is installed in vehicle). If the play is too little or too great, this leads to heavy wear on the teeth and can even cause entire teeth to break off.



Pinion clearance

The pinion clearance is the clearance between the ring gear or gear segment and the end face of the pinion with the starting motor in the rest position. If the clearance is too great, the pinion will not sufficiently mesh with the ring gear; the pinion teeth and the ring gear teeth do not have sufficient contact and are, therefore, heavily loaded on one side. The minimum clearance is necessary so that the pinion reliably demeshes, so that is does not strike against the moving ring gear in the case of heavy vibration and also so that it cannot mesh in so far that the pinion shaft comes up against the ring gear.

Pinion clearance 3.0 ... 4.0 mm.

Test procedure

Set the measuring-range selector switch. In the case of test benches with gear/ring gear, switch on the starting motor and slow down until it comes to rest. Read off the test specifications. Perform the test only briefly, for a maximum of 1 to 2 seconds.
In the case of test benches with a fixed gear segment, briefly switch on the starting motor and read off the test specifications.
The short-circuit test specifications are given in the table below.

Starting motor	V	A	Torque
0 001 370 ...	4.5	< 2400	> 95 Nm
...	4.0	< 2200	> 85 Nm
(with 2 batteries 12V 143Ah connected in parallel)			
0 001 371 ...	10.5	< 1700	> 58 Nm
...	9.0	< 1300	> 50 Nm
(with 2 batteries 12V 143Ah connected in series)			

For production reasons: continued on the following coordinate.

C21 — <==

C22 — => <=

TECHNICAL BULLETIN

HEALTH HAZARD DUE TO ASBESTOS DUST

VDT-I-Gen. 043 En
12.1981
supercedes edition 11.1981

Note on repair
Extractor for undercutting (commutator) saw

Working on asbestos or products containing asbestos results in the generation of dust and minute fibers which can in the long term lead to serious damage to health.

The European Community passed a law on March 28, 1981 restricting the use of asbestos and providing for new safety regulations with regard to working with materials containing asbestos.

NOTE ON THE REPAIR OF STARTING MOTORS, GENERATORS AND MOTORS

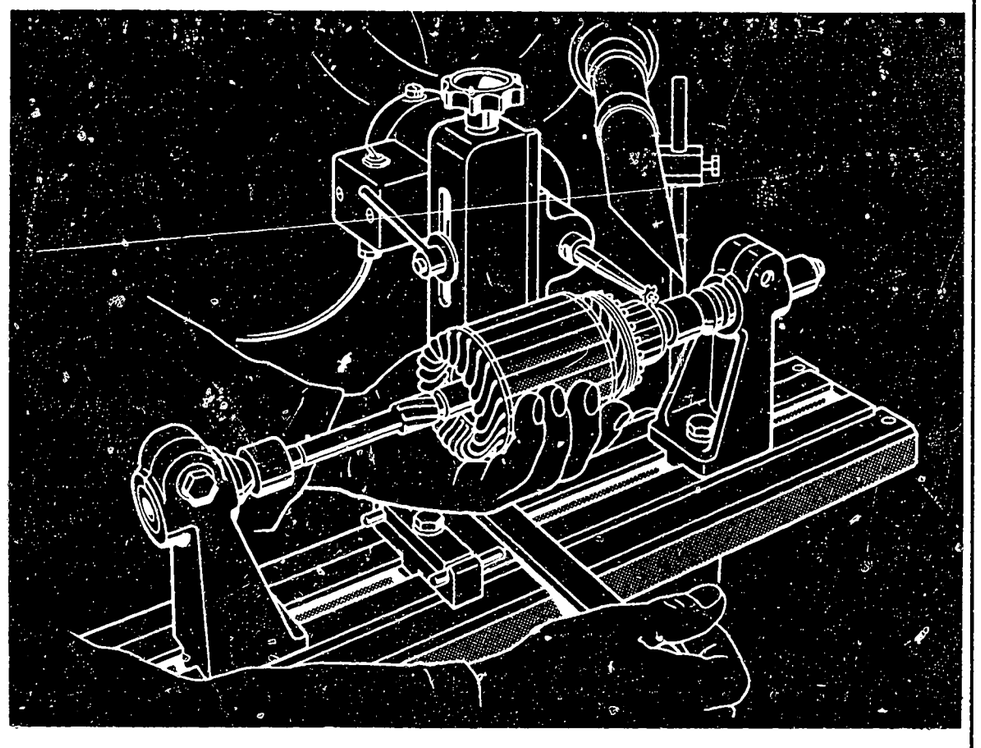
The insultation between the commutator segments of the armatures of starting motors, generators and motors still has a high asbestos content.
IT IS ABSOLUTELY ESSENTIAL TO EXTRACT THE ASBESTOS DUST GENERATED WHEN UNDERCUTTING THIS INSULATION WITH UNDERCUTTING SAW KDAW 9998!

As laid down in the new VDI guidelines, the asbestos dust must only be extracted with an APPROVED DIRT EXTRACTOR.

We therefore recommend the dirt extractor WAP-turbo-M-1 S-FA with the seal of approval of the German Employers' Liability Insurance Association, obtainable from

Firma Guido Oberdorfer
WAP-Maschinen
D-7919 Bellenberg
Tel. 07306/5055

N01 — ⟹



As an accessory for the extractor, we offer the stand KDAW 9998/20 which can be used for securing the suction tube with nozzle (see illustration).

Published by:

ROBERT BOSCH GMBH
Division KH
After-Sales Service Department for Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

N02 — ⟸

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